EXHIBIT 1

Report on Temperature Monitoring System Installation Schedule

Opinion and Order Article III.5

Bristol Integrated Solid Waste Management Facility
Bristol, Virginia
Solid Waste Permit No. 588

Bristol Integrated Solid Waste Management Facility
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Bristol, VA 24201
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SCS ENGINEERS

02218208.05-2 | September 14, 2022

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INTRODUCTION

SCS Engineers (SCS) has developed this Report on Temperature Monitoring System Installation Schedule (Report), on behalf of the City of Bristol, Virginia (City), in accordance with Article III.5 of the Opinion and Order, dated August 31, 2022, which requires the City to take the following action:

> *As a condition of the thermocouples deadline extension set forth above, Bristol Virginia must file with the Court on the public docket of this case a written report within 14 days of the date of entry of this Opinion and Order setting forth in detail the timeline of its intended bid process and available options for expediting the installation of the thermocouples system.*

BACKGROUND

In June 2022, in response to Article II.2 of the Preliminary Injunction Order, dated June 14, 2022, as well as in response to the Expert Panel Report recommendation 1.5 (Page iii), such Expert Panel having been commissioned by the Virginia Department of Environmental Quality (VDEQ), the City instructed SCS to commence work efforts to develop the engineering design and prepare construction bid documents for a Temperature Monitoring System (System) intended to accomplish the objectives and conform to the intent of Article II.2 and Recommendation 1.5.

The evaluation of potential technology options regarding selection of the specific instrumentation devices and controls, as well as the manner in which the system would be equipped with the industrial internet of things (IIoT) equipment to provide for a remote landfill temperature monitoring system, is discussed in Section 3.3 of the Report, titled "Plan of Action in Response to Expert Panel Report" (Action Plan), dated 7/6/22. The Action Plan presents the comparison of advantages and disadvantages of the various technology and instrumentation options that served as the basis for the System design reflected in the Drawings and Specifications that comprised the construction bid documents for purposes of soliciting bids from contractors.

The subtasks involved in the planning and cost estimating, preparation of preliminary conceptual design, engineering design, and development of construction bid documents related to the System, as well as the milestone dates on which these subtasks were completed, are presented in Items 1 through 11 of the Gantt Chart in **Exhibit 1**, titled "Schedule for Temperature Monitoring System Capital Project".

The subtasks involved in the initial bidding and procurement process (identified as "Procurement Iteration 1"), as well as revisions to the construction bid documents as a consequence of having not received a responsive Bid submittal during Procurement Iteration 1, and subsequent re-initiation of the bidding and procurement process (identified as "Procurement Iteration 2"), as well as the milestone dates on which these subtasks were completed, are presented in Items 12 through 24 of the Gantt Chart in **Exhibit 1**.

Based on communications with Prospective Bidders during the initial Pre-Bid Meeting, conducted on 7/13/22, as well as review of the one Bid received on 7/29/22 (which was determined to be non-responsive), SCS understood two primary reasons for contractors to perceive the System Installation Project as representing an unacceptable degree of risk. The reasons were:

1) the short duration of the Contract Times considering material procurement lead times and anticipated drilling production rates; and,

2) the mandate to order the temperature measurement instrumentation prior to completion of drilling and probe construction activities given uncertainties regarding the contractor's

ability in the field to achieve the ultimate borehole depths as designed, which could result in an incompatibility between the borehole depths and corresponding length of instrumentation ordered.

Accordingly, the revisions to the construction bid documents issued under Procurement Iteration 2 were focused on:

1) reducing the perception of risk by Prospective Bidders by extending the Contract Times in a manner that aligned material procurement lead times with projected timelines established by the material suppliers; and,

2) sequencing the project to accomplish drilling of the boreholes and installation of the temperature probes prior to ordering the custom-fabricated temperature measurement instrumentation.

PROPOSED SCHEDULE & BASIS FOR DURATIONS

Scenario A: The subtasks involved in the remaining steps of the subsequent bidding and procurement process associated with Procurement Iteration 2, as well as installation and commissioning of the System, and the estimated milestone dates on which these subtasks are anticipated to be completed, are presented in Items 25 through 38 of the Gantt Chart in **Exhibit 1**. .

- On August 26, 2022, the City transmitted the Invitation for Bids (IFB) documentation to 11 drilling contractors that SCS believes to be qualified to execute the System Installation Project.

- On September 7, 2022, three of these Prospective Bidders attended the Procurement Iteration 2 Non-Mandatory Pre-Bid Meeting.

- On September 26, 2022, the Bid Submittal is due.

Considerations that serve as the basis for certain durations depicted in Items 25 through 38 of the Gantt Chart in **Exhibit 1**, are noted below:

- **Item 31** - On 8/23/22, SCS contacted Mr. Austin Thompson of Preferred Pump in Asheville, NC and inquired what the anticipated material procurement lead time is for 2,000 feet of solid-wall 2-inch diameter Type 304 stainless steel well casing pipe. Mr. Thompson replied that the earliest possible shipment date from the time of receipt of a signed Purchase Order was four weeks, and that a reasonable lead time for delivery to the site was five to six weeks.

- **Item 33** – Based on the non-responsive Bid received on 7/29/22, SCS infers that this particular drilling contractor plans that the 2,000 vertical feet of borehole drilling will require at least 30 working days, or approximately 6 weeks. Considering the uncertainties associated with subsurface conditions that may be encountered, the proposed schedule allocated 7 weeks for borehole drilling and probe installation.

- **Item 34** - On 8/23/22, SCS contacted BeadedStream and inquired what the anticipated material procurement lead time is for 2,000 feet of the digital temperature cable with thermistors affixed at 20-foot interval. The sales representative replied that a reasonable

lead time for delivery to the site was six to seven weeks, but that lead times could potentially be slightly compressed later in the year.

- Item 37 – Based on the City's discussions with the LFG System O&M Contractor, the field work associated with installation of the controls panel, connection of the instrumentation to IIoT equipment and power supply, and integration into the telemetry platform is expected to require at least one week.

OPTIONS FOR ACCELERATING THE SCHEDULE

Ordering Probe Casing Pipe and/or Temperature Measurement instrumentation in Advance

Upon deliberation between the City and their consultants and contractors, the viable potential strategies for expediting the schedule involve commencing procurement of either the probe casing pipe, or the temperature measurement instrumentation, or both, earlier than the milestones reflected in Exhibit 1 above. For the probe casing pipe, this would correlate to placing the order in advance of executing the construction contract. For the temperature instrumentation, this would correlate to placing the order upon issuance of Notice-to-Proceed (which is in advance of the completion of temperature probe installation). Both scenarios enable material procurement lead times to occur concurrently with other activities (either in conjunction with bidding and contracting in the case of the piping, or in conjunction with drilling in the case of the instrumentation). A variation of this approach is to substitute alternate materials for the casing pipe, or the thermistors affixed to a digital temperature cable, that possess shorter material procurement lead time durations. An alternate strategy that pursues a different means to accomplish a similar outcome is to omit a probe casing pipe, such that the instrumentation is placed in-situ within the waste.

Scenario A: The schedule that correlates to the Milestone Dates established in the Invitation for Bids issued by the City on 8/26/22, is discussed above and the timeline is reflected on the Gantt Chart in Exhibit 1.

Scenario B: Assuming the City proceeds to procure the probe casing pipe directly prior to execution of the contract, and instructs the drilling contractor to mobilize upon issuance of NTP and utilize owner-supplied piping materials, the schedule can be accelerated as reflected in the Gantt Chart in Exhibit 2. Based on past experiences with landfill-related control and monitoring system projects, Scenario B introduces potential risks because all materials, parts, appurtenances, fittings, and supplies needed by the contractor to successfully accomplish the probe construction may not be easily attainable.

Scenario C: Assuming the City relies on the contractor to procure the probe casing pipe upon issuance of NTP, but instructs the contractor to procure the instrumentation concurrently with the probe casing pipe rather than wait for completion of the borehole drilling, the schedule can be accelerated as reflected in the Gantt Chart in Exhibit 3. Based on discussions with Prospective Bidders and the City's consultants and contractors, Scenario C introduces potential risks that may directly affect the performance capabilities of the temperature probes, including:

- compromise of the functionality of the instrumentation due to the adjustments;

- introduction of additional infrastructure to maintain at the surface of the well to properly manage the potential excess length of temperature measurement instrumentation; and,

- financial risk to the City if the number or depth of the probes ordered is in excess of what may properly implemented.

Scenario D: Assuming the City modifies the approach to eliminate any probe casing pipe and opts to install the instrumentation directly in-situ in the waste, the resulting schedule will generally be consistent with Scenario B, as reflected in the Gantt Chart in **Exhibit 4**. Based on past experiences with direct-buried temperature monitoring system instrumentation, Scenario D introduces potential risks that the instrumentation will become non-function due to exposure to leachate and/or landfill gas. Additionally, due to waste settlement and consolidation, disconnection of the signal wire from the measurement device may occur. Refer to discussion below regarding past experiences with direct-burial of temperature measurement devices at landfills. Also, the temperature measurement instrumentation should be procured in advance of the drilling, and be available on-site as the drilling is performed to prevent the boreholes from collapsing before installation occurs.

Scenario E: Assuming the City proceeds to procure both the probe casing pipe and the instrumentation prior to execution of the contract, the schedule can be accelerated as reflected in the Gantt Chart in **Exhibit 5**. This is essentially a combination of Scenarios B and C.

ADDITIONAL DISADVANTAGES TO PROPOSED ALTERNATIVE SCENARIOS

"Off the Shelf" Temperature Measurement Devices

As discussed in the Action Plan, the City's consultants and contractors evaluated three options for temperature measurement instrumentation: thermocouples, thermistors, and fiber optic cable. The Action Plan discusses the rationale for selection of the digital temperature cable (thermistor) as the preferred device technology. The advantages of thermistors compared to thermocouples include the following:

- Considering the objective to measure the temperature every 20 feet of boring depth, approximately 10 thermocouple cables would be required for many of the probes. Bundling this many cables and their associated terminations would be:
  - Difficult to install
  - Likely require a larger casing diameter than the designed casing
  - Difficult to service – removing the cables from the well would likely damage them given their large diameter and weight
  - Heavy – this is a health and safety hazard

- The digital temperature cable is designed for use in harsh environments like this and has one cable that transmits all of the data. The benefits of this are:
  - Ease of installation
  - Can utilize a fairly small casing diameter
  - Ease of service – you can easily pull the cable out of the well
  - Not as heavy as 10+ thermocouple cables

SCS has considered the use of alternative temperature sensors and the possibly of using an "off the shelf" product that might be more readily available. In most cases the use of such a product would require redesign of the proposed IIoT equipment and power source. Such redesign would introduce additional delays in the design and bidding processes.

Typical "off the shelf" products typically are not designed to endure the harsh environments prevalent deep within landfills experiencing subsurface conditions similar to those of the Bristol Quarry Landfill, such as elevated temperatures. Off the shelf products may not provide the long term temperature monitoring capability that is recommended by the expert panel.

Many of these off the shelf offerings are not readily available in 200+ foot (60+ meter) lengths that are required to monitor deep within the landfill. To utilize such products would likely require substantial delays due to the field modifications required, which may present additional technical challenges during both installation and operation. Such field modification also introduce potential additional failure points into the system.

Considering the drawbacks associated with the use of such a product, SCS believes this strategy would be detrimental to the quality of the final product and intended outcome of long-term, reliable temperature monitoring below the landfill's surface.

In-Situ "Direct-Buried" Temperature Measurement Devices

In June 2022, the City's consultants and contractors consulted both in-house and external sources to evaluate the most practical approach to installing temperature-monitoring probes (TMP) within the waste at the City of Bristol Landfill. Mr. Randy Mills, PG and Mr. Jim Walsh, PE of SCS have over 80 years combined experience in Solid Waste. Mr. Mills and Mr. Walsh performed TMP design and installation at Countywide Landfill in East Sparta, Ohio, an elevated temperature landfill (ETLF) that was under an administrative agreement with the US EPA. Mr. Walsh and Mr. Mills indicated that the longevity of any TMP is dependent upon exposure to landfill leachate, and that any long-term monitoring instruments be installed within a highly resistant, sealed pipe.

Mr. Steve Cooper (SCS) assisted Dr. James Hanson of California Polytechnic of San Luis Obispo with the installation and monitoring of an ETLF in Alaska. The results of the monitoring were reported in the publication "Spatial and Temporal Temperature Distribution in Municipal Solid Waste Landfills" (Hanson, et al, 2010). Dr. Hanson used "Type K" thermocouple arrays, installed in the early stages of waste placement. The array was sampled using a hand-held instrument that connected at the surface to each individual TMP. The paper states, "The significant features of an effective temperature measurement system for landfills are durability of sensors against a corrosive environment, during mechanical stresses and movements, rapid deployment, feasible monitoring, ability for extension at a future date, and ability to provide representative in situ measurements."

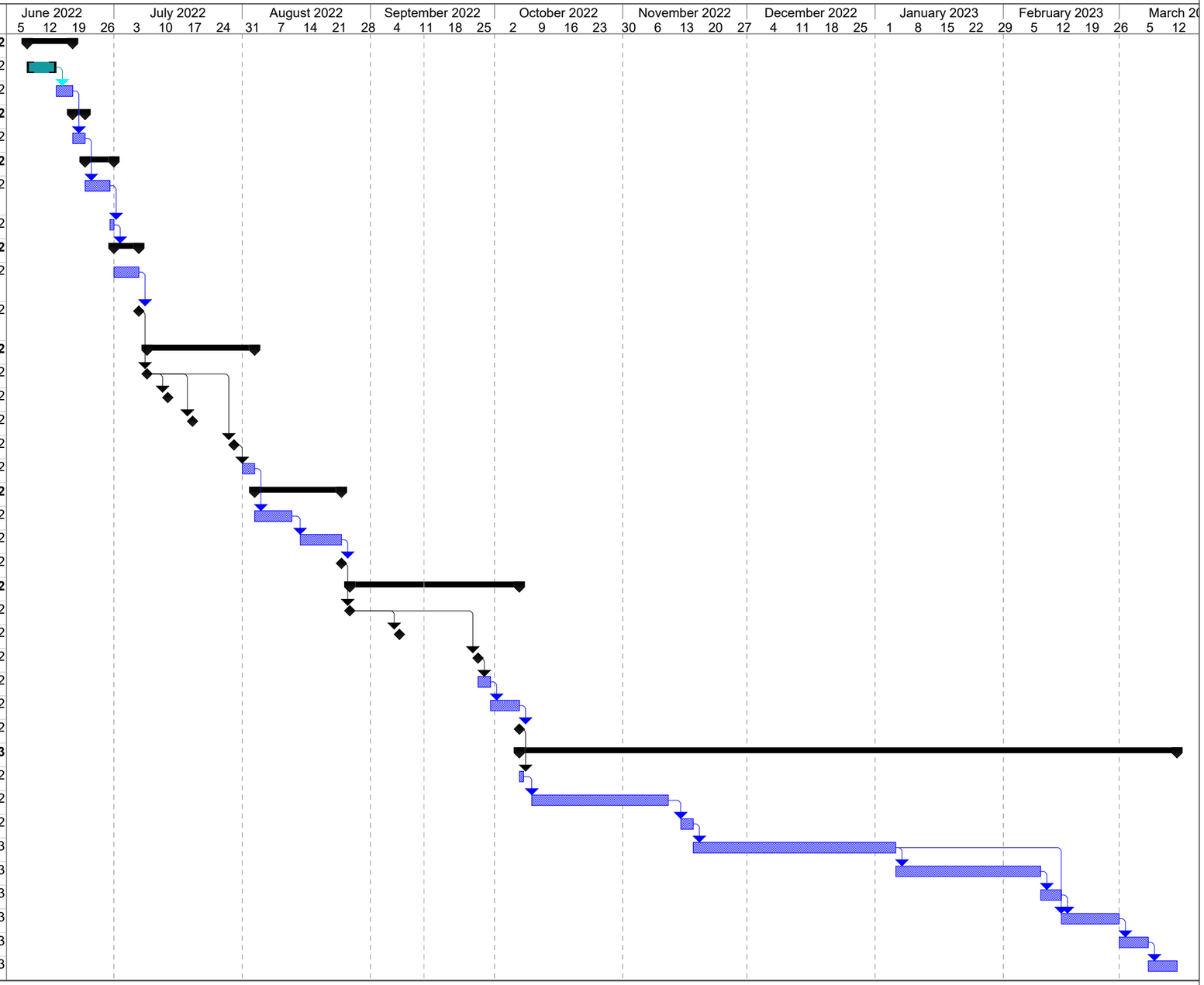
According to a 2016 Feezor Engineering, Inc. "North Quarry Subsurface Temperature Monitoring Probes Work Plan," for the North Quarry Landfill in Bridgeton, MO, "TMPs installed in waste have a discrete life. When some thermocouples fail, the TMP can still be used if a general trend in the TMP can be inferred as compared to historical records of that specific thermocouple interval.... However, if more than three consecutive thermocouple intervals fail, then the entire TMP will be replaced."

Whether the TMPs consist of thermocouples or thermistors, the strings must be assembled prior to installation with the correct number and spacing for each based on the depth achieved during drilling.

Exhibit 1. Schedule for Temperature Monitoring System Capital Project - Scenario A
Bristol Landfill #588 - Bristol, Virginia

SCS ENGINEERS

ID	Task Name	Duration	Start	Finish
1	**Planning & Cost Estimating**	**7 days**	**Fri 6/10/22**	**Mon 6/20/22**
2	Planning & Research on Drilling & Instrumentation	5 days	Fri 6/10/22	Thu 6/16/22
3	Development of Cost Estimate	2 days	Fri 6/17/22	Mon 6/20/22
4	**Preliminary Conceptual Design**	**3 days**	**Tue 6/21/22**	**Thu 6/23/22**
5	Outlining Potential Design Scenarios	3 days	Tue 6/21/22	Thu 6/23/22
6	**Engineering Design**	**5 days**	**Fri 6/24/22**	**Thu 6/30/22**
7	Temperature Monitoring System Design Drawings, & Specifications	4 days	Fri 6/24/22	Wed 6/29/22
8	Quantity Take-Off & Final Cost	1 day	Thu 6/30/22	Thu 6/30/22
9	**Development of Construction Bid Documents**	**4 days**	**Fri 7/1/22**	**Wed 7/6/22**
10	Develop Temperature Monitoring System Construction Documents (Drawings & Specifications)	4 days	Fri 7/1/22	Wed 7/6/22
11	Submit Temperature Monitoring System Construction Bid Documents to City	0 days	Wed 7/6/22	Wed 7/6/22
12	**Temperature Monitoring System Bidding - Round 1**	**18 days**	**Fri 7/8/22**	**Wed 8/3/22**
13	Issue Bid Documents	0 days	Fri 7/8/22	Fri 7/8/22
14	Conduct Pre-Bid Meeting	0 days	Wed 7/13/22	Wed 7/13/22
15	Issue Addendum	0 days	Tue 7/19/22	Tue 7/19/22
16	Receive Bids from Contractors	0 days	Fri 7/29/22	Fri 7/29/22
17	Review Bids & Determine Non-Responsive	3 days	Mon 8/1/22	Wed 8/3/22
18	**Revise Construction Bid Documents**	**15 days**	**Thu 8/4/22**	**Wed 8/24/22**
19	City Assessment of Options	7 days	Thu 8/4/22	Fri 8/12/22
20	Develop Modified Construction Bid Documents	8 days	Mon 8/15/22	Wed 8/24/22
21	Submit Revised Construction Bid Documents to City	0 days	Wed 8/24/22	Wed 8/24/22
22	**Temperature Monitoring System Bidding - Round 2**	**29 days**	**Fri 8/26/22**	**Thu 10/6/22**
23	Issue Bid Documents	0 days	Fri 8/26/22	Fri 8/26/22
24	Conduct Pre-Bid Meeting	0 days	Wed 9/7/22	Wed 9/7/22
25	Receive Bids from Contractors	0 days	Mon 9/26/22	Mon 9/26/22
26	Review Bids & Recommend Award	3 days	Tue 9/27/22	Thu 9/29/22
27	Contract Negotiation	1 wk	Fri 9/30/22	Thu 10/6/22
28	Contract Approval by City Council	0 days	Thu 10/6/22	Thu 10/6/22
29	**Temperature Monitoring System Installation**	**113 days**	**Fri 10/7/22**	**Tue 3/14/23**
30	Issue Notice-to-Proceed	1 day	Fri 10/7/22	Fri 10/7/22
31	Temperature Probe Pipe Procurement (Lead Time & Delivery)	5 wks	Mon 10/10/22	Fri 11/11/22
32	Contractor Mobilization	3 days	Tue 11/15/22	Thu 11/17/22
33	Drilling Temperature Probes	7 wks	Fri 11/18/22	Thu 1/5/23
34	Procurement of DTC Instrumentation	5 wks	Fri 1/6/23	Thu 2/9/23
35	Contractor Mobilization	3 days	Fri 2/10/23	Tue 2/14/23
36	Install DTC Instrumentation into Probes	10 days	Wed 2/15/23	Tue 2/28/23
37	Install Control Panels, Power Supply, & Telemetry	1 wk	Wed 3/1/23	Tue 3/7/23
38	Temperature Monitoring System Start-Up & Commissioning	1 wk	Wed 3/8/23	Tue 3/14/23



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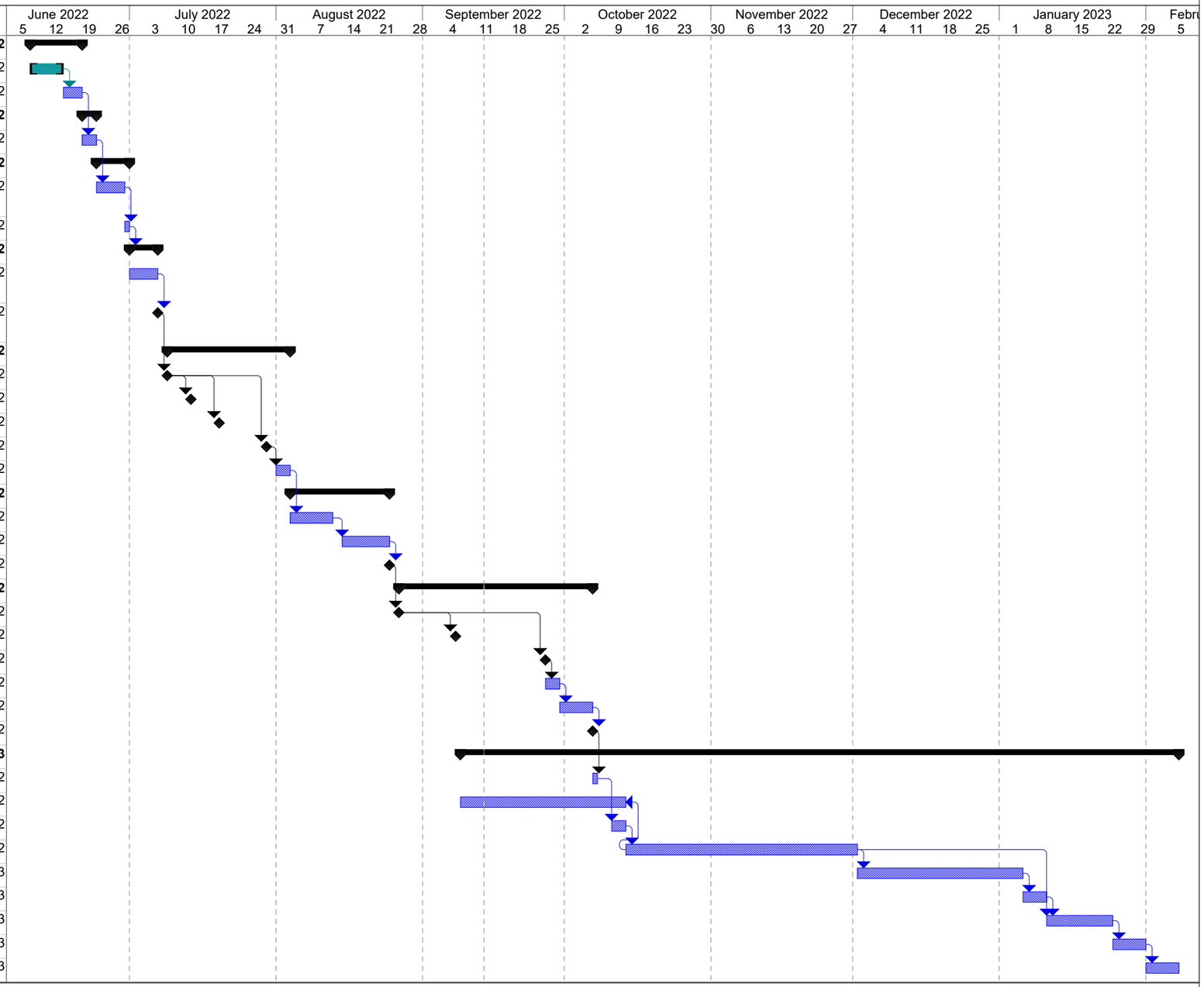
Task	Rolled Up Progress	Inactive Task	Duration-only	External Tasks
Milestone	Split	Inactive Milestone	Manual Summary Rollup	External Milestone
Summary	External Tasks	Inactive Milestone	Manual Summary	Progress
Rolled Up Task	Project Summary	Inactive Summary	Start-only	Deadline
Rolled Up Milestone	Group By Summary	Manual Task	Finish-only	

Exhibit 2. Schedule for Temperature Monitoring System Capital Project - Scenario B
Bristol Landfill #588 - Bristol, Virginia

SCS ENGINEERS

ID	Task Name	Duration	Start	Finish
1	**Planning & Cost Estimating**	**7 days**	**Fri 6/10/22**	**Mon 6/20/22**
2	Planning & Research on Drilling & Instrumentation	5 days	Fri 6/10/22	Thu 6/16/22
3	Development of Cost Estimate	2 days	Fri 6/17/22	Mon 6/20/22
4	**Preliminary Conceptual Design**	**3 days**	**Tue 6/21/22**	**Thu 6/23/22**
5	Outlining Potential Design Scenarios	3 days	Tue 6/21/22	Thu 6/23/22
6	**Engineering Design**	**5 days**	**Fri 6/24/22**	**Thu 6/30/22**
7	Temperature Monitoring System Design Drawings, & Specifications	4 days	Fri 6/24/22	Wed 6/29/22
8	Quantity Take-Off & Final Cost	1 day	Thu 6/30/22	Thu 6/30/22
9	**Development of Construction Bid Documents**	**4 days**	**Fri 7/1/22**	**Wed 7/6/22**
10	Develop Temperature Monitoring System Construction Documents (Drawings & Specifications)	4 days	Fri 7/1/22	Wed 7/6/22
11	Submit Temperature Monitoring System Construction Bid Documents to City	0 days	Wed 7/6/22	Wed 7/6/22
12	**Temperature Monitoring System Bidding - Round 1**	**18 days**	**Fri 7/8/22**	**Wed 8/3/22**
13	Issue Bid Documents	0 days	Fri 7/8/22	Fri 7/8/22
14	Conduct Pre-Bid Meeting	0 days	Wed 7/13/22	Wed 7/13/22
15	Issue Addendum	0 days	Tue 7/19/22	Tue 7/19/22
16	Receive Bids from Contractors	0 days	Fri 7/29/22	Fri 7/29/22
17	Review Bids & Determine Non-Responsive	3 days	Mon 8/1/22	Wed 8/3/22
18	**Revise Construction Bid Documents**	**15 days**	**Thu 8/4/22**	**Wed 8/24/22**
19	City Assessment of Options	7 days	Thu 8/4/22	Fri 8/12/22
20	Develop Modified Construction Bid Documents	8 days	Mon 8/15/22	Wed 8/24/22
21	Submit Revised Construction Bid Documents to City	0 days	Wed 8/24/22	Wed 8/24/22
22	**Temperature Monitoring System Bidding - Round 2**	**29 days**	**Fri 8/26/22**	**Thu 10/6/22**
23	Issue Bid Documents	0 days	Fri 8/26/22	Fri 8/26/22
24	Conduct Pre-Bid Meeting	0 days	Wed 9/7/22	Wed 9/7/22
25	Receive Bids from Contractors	0 days	Mon 9/26/22	Mon 9/26/22
26	Review Bids & Recommend Award	3 days	Tue 9/27/22	Thu 9/29/22
27	Contract Negotiation	1 wk	Fri 9/30/22	Thu 10/6/22
28	Contract Approval by City Council	0 days	Thu 10/6/22	Thu 10/6/22
29	**Temperature Monitoring System Installation**	**108 days**	**Fri 9/9/22**	**Tue 2/7/23**
30	Issue Notice-to-Proceed	1 day	Fri 10/7/22	Fri 10/7/22
31	Temperature Probe Pipe Procurement (Lead Time & Delivery)	5 wks	Fri 9/9/22	Fri 10/14/22
32	Contractor Mobilization	3 days	Tue 10/11/22	Thu 10/13/22
33	Drilling Temperature Probes	7 wks	Fri 10/14/22	Thu 12/1/22
34	Procurement of DTC Instrumentation	5 wks	Fri 12/2/22	Thu 1/5/23
35	Contractor Mobilization	3 days	Fri 1/6/23	Tue 1/10/23
36	Install DTC Instrumentation into Probes	10 days	Wed 1/11/23	Tue 1/24/23
37	Install Control Panels, Power Supply, & Telemetry	1 wk	Wed 1/25/23	Tue 1/31/23
38	Temperature Monitoring System Start-Up & Commissioning	1 wk	Wed 2/1/23	Tue 2/7/23



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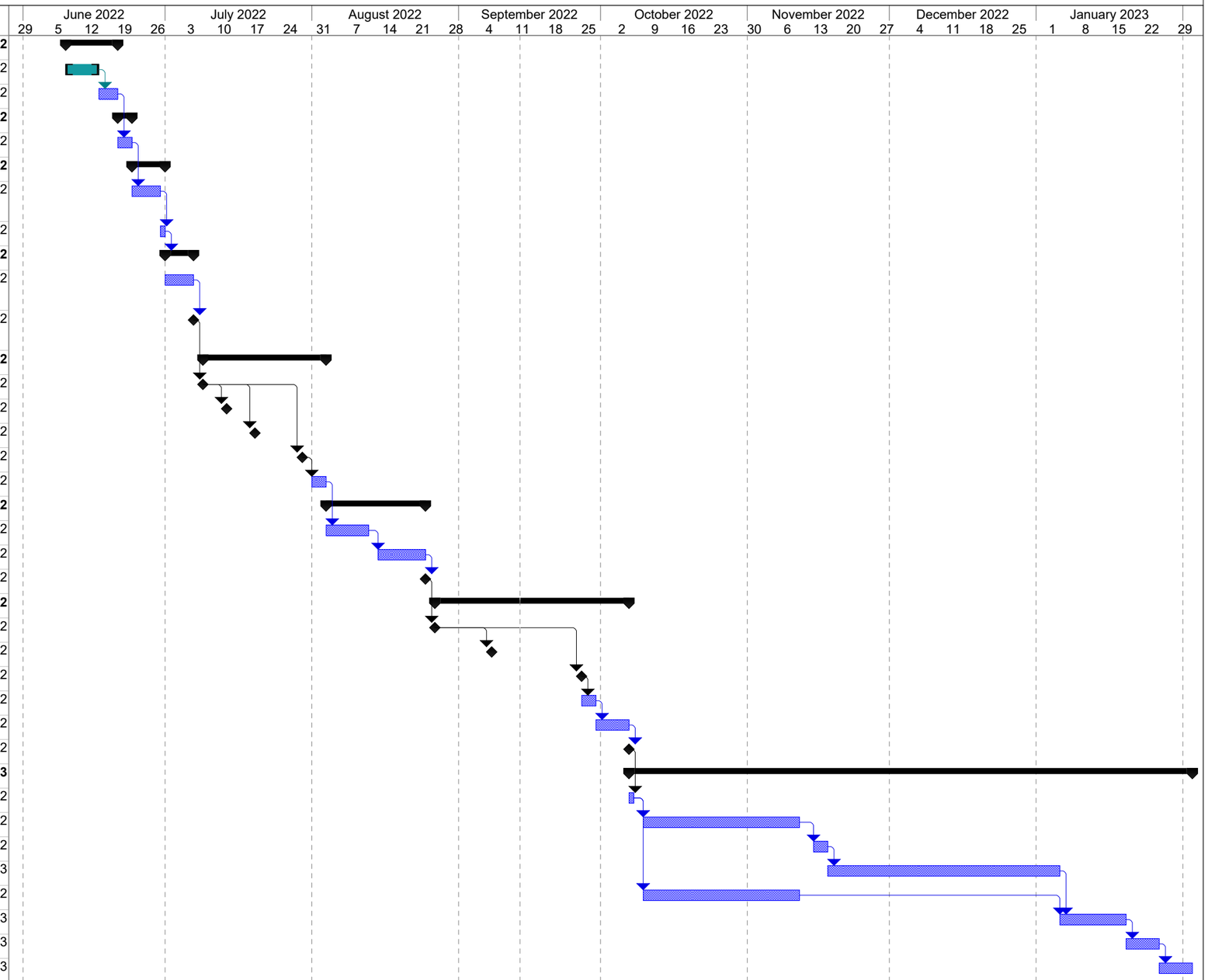
Task	Rolled Up Progress	Inactive Task	Duration-only	External Tasks
Milestone	Split	Inactive Milestone	Manual Summary Rollup	External Milestone
Summary	External Tasks	Inactive Milestone	Manual Summary	Progress
Rolled Up Task	Project Summary	Inactive Summary	Start-only	Deadline
Rolled Up Milestone	Group By Summary	Manual Task	Finish-only	

Exhibit 3. Hypothetical Expedited Schedule for Temperature Monitoring System Capital Project - Scenario C
Bristol Landfill #588 - Bristol, Virginia

SCS ENGINEERS

ID	Task Name	Duration	Start	Finish
1	**Planning & Cost Estimating**	**7 days**	**Fri 6/10/22**	**Mon 6/20/22**
2	Planning & Research on Drilling & Instrumentation	5 days	Fri 6/10/22	Thu 6/16/22
3	Development of Cost Estimate	2 days	Fri 6/17/22	Mon 6/20/22
4	**Preliminary Conceptual Design**	**3 days**	**Tue 6/21/22**	**Thu 6/23/22**
5	Outlining Potential Design Scenarios	3 days	Tue 6/21/22	Thu 6/23/22
6	**Engineering Design**	**5 days**	**Fri 6/24/22**	**Thu 6/30/22**
7	Temperature Monitoring System Design Drawings, & Specifications	4 days	Fri 6/24/22	Wed 6/29/22
8	Quantity Take-Off & Final Cost	1 day	Thu 6/30/22	Thu 6/30/22
9	**Development of Construction Bid Documents**	**4 days**	**Fri 7/1/22**	**Wed 7/6/22**
10	Develop Temperature Monitoring System Construction Documents (Drawings & Specifications)	4 days	Fri 7/1/22	Wed 7/6/22
11	Submit Temperature Monitoring System Construction Bid Documents to City	0 days	Wed 7/6/22	Wed 7/6/22
12	**Temperature Monitoring System Bidding - Round 1**	**18 days**	**Fri 7/8/22**	**Wed 8/3/22**
13	Issue Bid Documents	0 days	Fri 7/8/22	Fri 7/8/22
14	Conduct Pre-Bid Meeting	0 days	Wed 7/13/22	Wed 7/13/22
15	Issue Addendum	0 days	Tue 7/19/22	Tue 7/19/22
16	Receive Bids from Contractors	0 days	Fri 7/29/22	Fri 7/29/22
17	Review Bids & Determine Non-Responsive	3 days	Mon 8/1/22	Wed 8/3/22
18	**Revise Construction Bid Documents**	**15 days**	**Thu 8/4/22**	**Wed 8/24/22**
19	City Assessment of Options	7 days	Thu 8/4/22	Fri 8/12/22
20	Develop Modified Construction Bid Documents	8 days	Mon 8/15/22	Wed 8/24/22
21	Submit Revised Construction Bid Documents to City	0 days	Wed 8/24/22	Wed 8/24/22
22	**Temperature Monitoring System Bidding - Round 2**	**29 days**	**Fri 8/26/22**	**Thu 10/6/22**
23	Issue Bid Documents	0 days	Fri 8/26/22	Fri 8/26/22
24	Conduct Pre-Bid Meeting	0 days	Wed 9/7/22	Wed 9/7/22
25	Receive Bids from Contractors	0 days	Mon 9/26/22	Mon 9/26/22
26	Review Bids & Recommend Award	3 days	Tue 9/27/22	Thu 9/29/22
27	Contract Negotiation	1 wk	Fri 9/30/22	Thu 10/6/22
28	Contract Approval by City Council	0 days	Thu 10/6/22	Thu 10/6/22
29	**Temperature Monitoring System Installation**	**85 days**	**Fri 10/7/22**	**Thu 2/2/23**
30	Issue Notice-to-Proceed	1 day	Fri 10/7/22	Fri 10/7/22
31	Temperature Probe Pipe Procurement (Lead Time & Delivery)	5 wks	Mon 10/10/22	Fri 11/11/22
32	Contractor Mobilization	3 days	Tue 11/15/22	Thu 11/17/22
33	Drilling Temperature Probes	7 wks	Fri 11/18/22	Thu 1/5/23
34	Procurement of DTC Instrumentation (Lead Time & Delivery)	5 wks	Mon 10/10/22	Fri 11/11/22
35	Install DTC Instrumentation into Probes	10 days	Fri 1/6/23	Thu 1/19/23
36	Install Control Panels, Power Supply, & Telemetry	1 wk	Fri 1/20/23	Thu 1/26/23
37	Temperature Monitoring System Start-Up & Commissioning	1 wk	Fri 1/27/23	Thu 2/2/23



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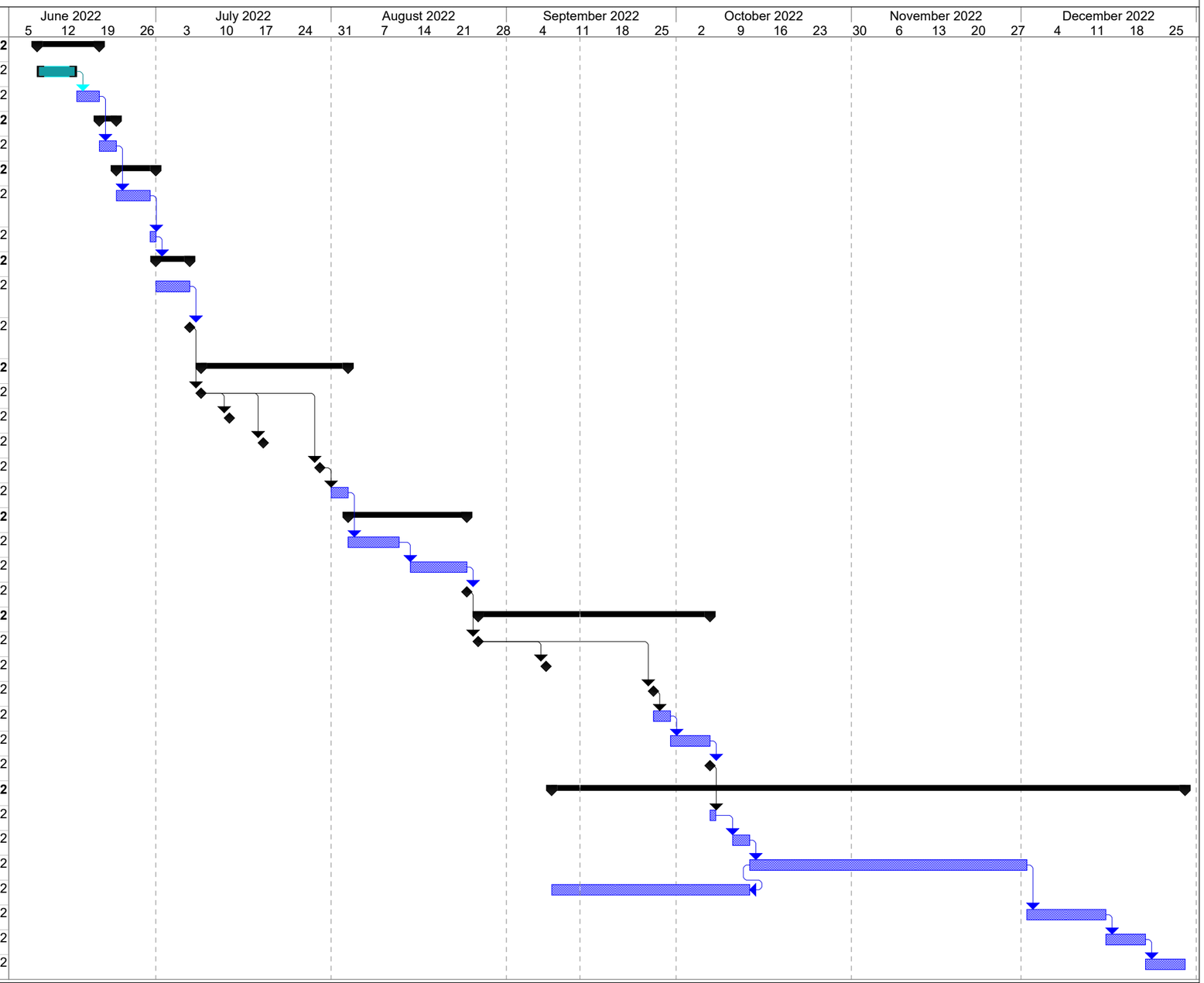
Task	Rolled Up Progress	Inactive Task	Duration-only	External Tasks
Milestone	Split	Inactive Milestone	Manual Summary Rollup	External Milestone
Summary	External Tasks	Inactive Milestone	Manual Summary	Progress
Rolled Up Task	Project Summary	Inactive Summary	Start-only	Deadline
Rolled Up Milestone	Group By Summary	Manual Task	Finish-only	

Exhibit 4. Schedule for Temperature Monitoring System Capital Project - Scenario D
Bristol Landfill #588 - Bristol, Virginia

SCS ENGINEERS

ID	Task Name	Duration	Start	Finish
1	**Planning & Cost Estimating**	**7 days**	**Fri 6/10/22**	**Mon 6/20/22**
2	Planning & Research on Drilling & Instrumentation	5 days	Fri 6/10/22	Thu 6/16/22
3	Development of Cost Estimate	2 days	Fri 6/17/22	Mon 6/20/22
4	**Preliminary Conceptual Design**	**3 days**	**Tue 6/21/22**	**Thu 6/23/22**
5	Outlining Potential Design Scenarios	3 days	Tue 6/21/22	Thu 6/23/22
6	**Engineering Design**	**5 days**	**Fri 6/24/22**	**Thu 6/30/22**
7	Temperature Monitoring System Design Drawings, & Specifications	4 days	Fri 6/24/22	Wed 6/29/22
8	Quantity Take-Off & Final Cost	1 day	Thu 6/30/22	Thu 6/30/22
9	**Development of Construction Bid Documents**	**4 days**	**Fri 7/1/22**	**Wed 7/6/22**
10	Develop Temperature Monitoring System Construction Documents (Drawings & Specifications)	4 days	Fri 7/1/22	Wed 7/6/22
11	Submit Temperature Monitoring System Construction Bid Documents to City	0 days	Wed 7/6/22	Wed 7/6/22
12	**Temperature Monitoring System Bidding - Round 1**	**18 days**	**Fri 7/8/22**	**Wed 8/3/22**
13	Issue Bid Documents	0 days	Fri 7/8/22	Fri 7/8/22
14	Conduct Pre-Bid Meeting	0 days	Wed 7/13/22	Wed 7/13/22
15	Issue Addendum	0 days	Tue 7/19/22	Tue 7/19/22
16	Receive Bids from Contractors	0 days	Fri 7/29/22	Fri 7/29/22
17	Review Bids & Determine Non-Responsive	3 days	Mon 8/1/22	Wed 8/3/22
18	**Revise Construction Bid Documents**	**15 days**	**Thu 8/4/22**	**Wed 8/24/22**
19	City Assessment of Options	7 days	Thu 8/4/22	Fri 8/12/22
20	Develop Modified Construction Bid Documents	8 days	Mon 8/15/22	Wed 8/24/22
21	Submit Revised Construction Bid Documents to City	0 days	Wed 8/24/22	Wed 8/24/22
22	**Temperature Monitoring System Bidding - Round 2**	**29 days**	**Fri 8/26/22**	**Thu 10/6/22**
23	Issue Bid Documents	0 days	Fri 8/26/22	Fri 8/26/22
24	Conduct Pre-Bid Meeting	0 days	Wed 9/7/22	Wed 9/7/22
25	Receive Bids from Contractors	0 days	Mon 9/26/22	Mon 9/26/22
26	Review Bids & Recommend Award	3 days	Tue 9/27/22	Thu 9/29/22
27	Contract Negotiation	1 wk	Fri 9/30/22	Thu 10/6/22
28	Contract Approval by City Council	0 days	Thu 10/6/22	Thu 10/6/22
29	**Temperature Monitoring System Installation**	**80 days**	**Fri 9/9/22**	**Thu 12/29/22**
30	Issue Notice-to-Proceed	1 day	Fri 10/7/22	Fri 10/7/22
31	Contractor Mobilization	3 days	Tue 10/11/22	Thu 10/13/22
32	Drilling Temperature Probes	7 wks	Fri 10/14/22	Thu 12/1/22
33	Procurement of DTC Instrumentation	5 wks	Fri 9/9/22	Fri 10/14/22
34	Install DTC Instrumentation into Probes	10 days	Fri 12/2/22	Thu 12/15/22
35	Install Control Panels, Power Supply, & Telemetry	1 wk	Fri 12/16/22	Thu 12/22/22
36	Temperature Monitoring System Start-Up & Commissioning	1 wk	Fri 12/23/22	Thu 12/29/22



Project: 02218208.12
Date: 09/14/2022

Task	Rolled Up Progress	Inactive Task	Duration-only	External Tasks
Milestone	Split	Inactive Milestone	Manual Summary Rollup	External Milestone
Summary	External Tasks	Inactive Milestone	Manual Summary	Progress
Rolled Up Task	Project Summary	Inactive Summary	Start-only	Deadline
Rolled Up Milestone	Group By Summary	Manual Task	Finish-only	

Exhibit 5. Schedule for Temperature Monitoring System Capital Project - Scenario E
Bristol Landfill #588 - Bristol, Virginia

SCS ENGINEERS

ID	Task Name	Duration	Start	Finish
1	**Planning & Cost Estimating**	**7 days**	**Fri 6/10/22**	**Mon 6/20/22**
2	Planning & Research on Drilling & Instrumentation	5 days	Fri 6/10/22	Thu 6/16/22
3	Development of Cost Estimate	2 days	Fri 6/17/22	Mon 6/20/22
4	**Preliminary Conceptual Design**	**3 days**	**Tue 6/21/22**	**Thu 6/23/22**
5	Outlining Potential Design Scenarios	3 days	Tue 6/21/22	Thu 6/23/22
6	**Engineering Design**	**5 days**	**Fri 6/24/22**	**Thu 6/30/22**
7	Temperature Monitoring System Design Drawings, & Specifications	4 days	Fri 6/24/22	Wed 6/29/22
8	Quantity Take-Off & Final Cost	1 day	Thu 6/30/22	Thu 6/30/22
9	**Development of Construction Bid Documents**	**4 days**	**Fri 7/1/22**	**Wed 7/6/22**
10	Develop Temperature Monitoring System Construction Documents (Drawings & Specifications)	4 days	Fri 7/1/22	Wed 7/6/22
11	Submit Temperature Monitoring System Construction Bid Documents to City	0 days	Wed 7/6/22	Wed 7/6/22
12	**Temperature Monitoring System Bidding - Round 1**	**18 days**	**Fri 7/8/22**	**Wed 8/3/22**
13	Issue Bid Documents	0 days	Fri 7/8/22	Fri 7/8/22
14	Conduct Pre-Bid Meeting	0 days	Wed 7/13/22	Wed 7/13/22
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28	Contract Approval by City Council	0 days	Thu 10/6/22	Thu 10/6/22
29	**Temperature Monitoring System Installation**	**80 days**	**Fri 9/9/22**	**Thu 12/29/22**
30	Issue Notice-to-Proceed	1 day	Fri 10/7/22	Fri 10/7/22
31	Temperature Probe Pipe Procurement (Lead Time & Delivery)	5 wks	Fri 9/9/22	Fri 10/14/22
32	Contractor Mobilization	3 days	Tue 10/11/22	Thu 10/13/22
33	Drilling Temperature Probes	7 wks	Fri 10/14/22	Thu 12/1/22
34	Procurement of DTC Instrumentation	5 wks	Fri 9/9/22	Fri 10/14/22
35	Install DTC Instrumentation into Probes	10 days	Fri 12/2/22	Thu 12/15/22
36	Install Control Panels, Power Supply, & Telemetry	1 wk	Fri 12/16/22	Thu 12/22/22
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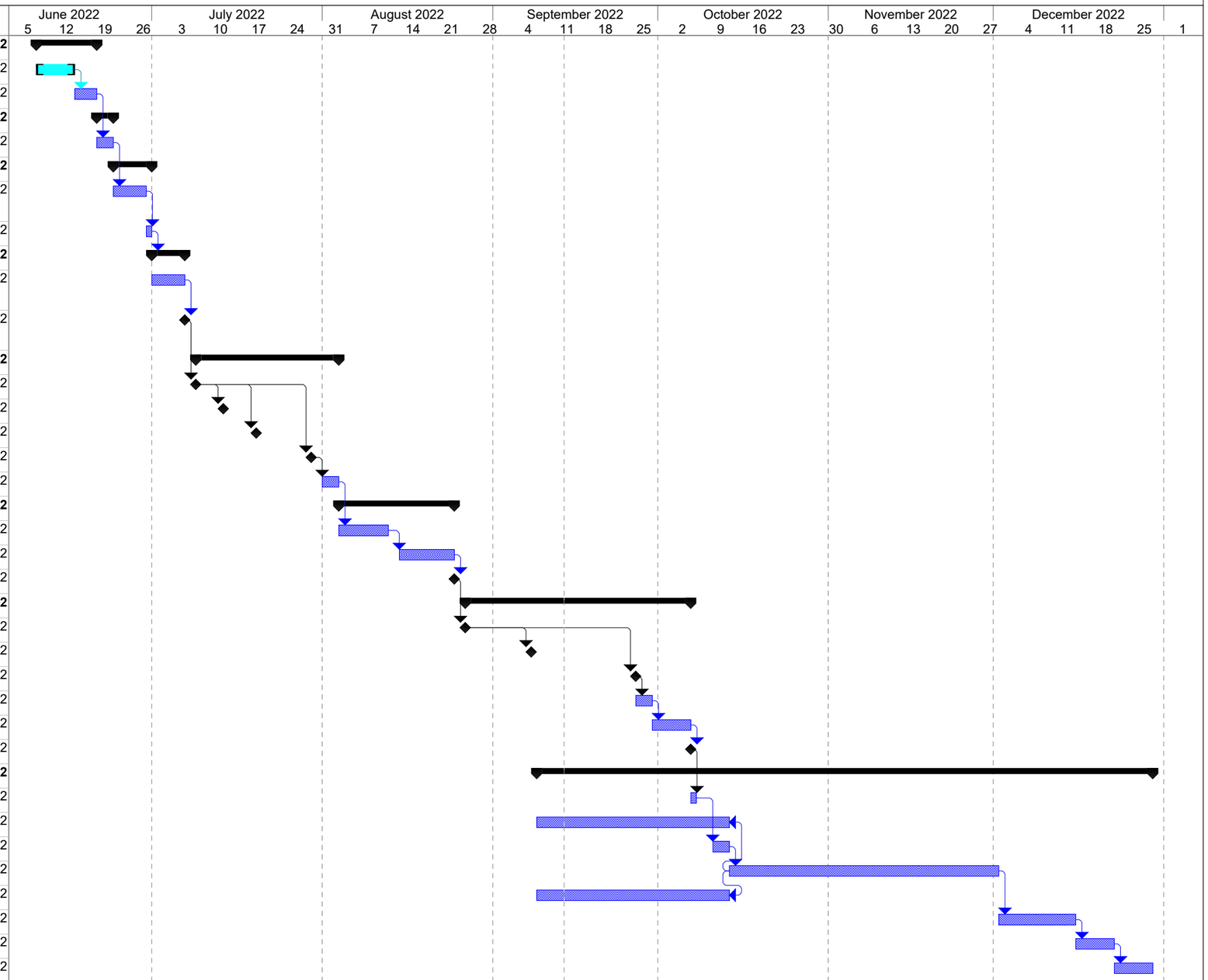

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Task	Rolled Up Progress	Inactive Task	Duration-only	External Tasks
Milestone	Split	Inactive Milestone	Manual Summary Rollup	External Milestone
Summary	External Tasks	Inactive Milestone	Manual Summary	Progress
Rolled Up Task	Project Summary	Inactive Summary	Start-only	Deadline
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